**U.S. FISH AND WILDLIFE SERVICE**
**SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Typhlatya monae*

COMMON NAME: troglobitic groundwater shrimp

LEAD REGION: 4

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

___ Species assessment- determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: May 11, 2004
___ 90-day positive - FR date: ___
___ 12-month warranted but precluded - FR date: ___
_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? _yes_
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes_
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

___ Listing priority change
Former LP: ___
New LP: ___

Date when the species first became a Candidate (as currently defined): 10/25/99

___ Candidate removal: Former LP: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Crustacean - Atyidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Puerto Rico, Barbuda, Dominican Republic

CURRENT STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Puerto Rico, Barbuda, Dominican Republic

LAND OWNERSHIP: All known sites in Puerto Rico are located on land owned and managed by the Commonwealth of Puerto Rico.

LEAD REGION CONTACT: Richard Gooch, 404/679-7124

LEAD FIELD OFFICE CONTACT: Dr. Jorge E. Saliva, Caribbean Field Office, 787/851-7297

BIOLOGICAL INFORMATION:

Description

*Typhlatya monae* is a small groundwater shrimp, reaching 4.5 millimeters (0.2 inches) in carapace length, with a translucent body and with a pigmented spot in the eyestalk. Some individuals may appear to be light yellow-orange due to the color of the internal organs.

Taxonomy

*Typhlatya* is an almost exclusively subterranean genus of small shrimps, originally thought to be represented worldwide by 11 species; however, three new species from anchialine caves (saltwater pools with no intrusion from the ocean) in Mexico (*Typhlatya dzilamensis*), the

Bahamas (*Typhlatya kakuki*), and Honduras (*Typhlatya utilaensis*) have been described recently (Alvarez *et al*. 2005). The close similarities of the known species suggest a common origin (Chace 1972). The present forms represent relics of a much more widespread ancestral stock of which no trace is known to exist. Four species of troglobitic groundwater shrimps occur in the Antilles: *Typhlatya garciai*, *Typhlatya consobrina*, *Typhlatya taina*, and *Typhlatya monae* (Conde Costas and González De Segal 1996). *Typhlatya dzilamensis* is the fourth species described from the Yucatan Peninsula, Mexico, and it is morphologically similar to *Typhlatya mitchelli*. *Typhlatya kakuki* is the first species of the genus to be described from the Bahamas archipelago. Its morphology departs from the patterns shown by the Cuban species, which are the closest geographically. *Typhlatya utilaensis* is the first species described from Central America, and morphologically is related to *Typhlatya monae* (Alvarez *et al*. 2005).

Troglobitic development requires as a first step subterranean colonization by a troglophile species, and the extinction of its intervening surface population, to achieve genetic isolation of the species. It is theorized that the ancestral form of *Typhlatya monae*, an ancestral marine form, eventually became adapted to a freshwater existence, as have their troglobitic forms (Chace 1969). The disappearance of the ancestral stock suggests an inability of the surface members to compete with other faunas that have invaded their range, or their extermination by saltwater during the Pleistocene inundations of their range. Nevertheless, those forms that invaded fresh groundwater survived, because sufficient land mass remained providing a freshwater recharge to the aquifers (Conde-Costas and González 1996). Chace and Hobbs (1969) theorized that the presence of *Typhlatya monae* at disjunct locations through the Antilles was a result of parallel evolution of the ancestral stock. According to the Biological Resources Division of the U.S. Geological Survey, *Typhlatya monae* is a valid species, not synonymous with other taxa, and its taxonomic status represents the present understanding of its taxonomic validity as reflected in its nomenclature (i.e., not polytypic); with no need of taxonomic studies (Bouchard 1995).

Habitat/Life History

The Puerto Rico Department of Natural and Environmental Resources manage both the Guánica Commonwealth Forest and Mona Island; localities where *Typhlatya monae* is found. Both are located within the subtropical dry forest life zone, in areas that overlie a limestone substrate. In these areas, the vegetation is typically more xerophytic than that of other soil types in this life zone, and mean annual precipitation is approximately 66 centimeters (25.7 inches), distributed in distinct wet (August through November) and dry (January through March) seasons. Mean annual temperature in Guánica has been reported to be 25.3°C, with a mean monthly minimum of 23.5°C and a mean monthly maximum of 26.7°C.

The Guánica Commonwealth Forest is located in the municipalities of Guánica, Yauco, and Guayanilla in southwestern Puerto Rico, and encompasses an area of about 4,000 hectares (9,880 acres). Twelve known caves are found in the forest, most of them formed within the Ponce limestone by solution processes at the fresh-saltwater mixing zone. A total of 34 invertebrate species has been reported from these caves and, of the five aquatic troglobitic species known from Puerto Rico, three are found in the ground waters of Guánica. Mona Island is located approximately 68 kilometers (42 miles) to the southwest of Puerto Rico and is about 5,500

hectares (13,585 acres) in size. Mona Island is a flat limestone plateau bounded by high vertical cliffs. Twenty-five major caves, distributed along the periphery of the island, have been documented. The majority has been formed at the contact between Lirio limestone and the underlying Mona dolomite by solution processes. The entrances are usually found on sea cliffs, where openings have formed from roof collapse. Most of the caves are dry, but two provide access to the aquifer's water table. Forty-six invertebrate species have been documented in these caves, of which three are troglobitic.

These ground-water shrimp of the genus *Typhlatya* are classified as troglobites, or obligatory cave organisms, of which their most extraordinary feature is the reduction or loss of vision and pigmentation. In the Guánica caves, the ground-water shrimp feeds on organic waste material and debris, and a steady input of fresh organic material available in this cave. It is believed that the shrimp is not restricted to the cave's aquatic habitat, but may also be found within the aquifer conduit system connecting the cave's groundwater environment. *Typhlatya monae* was found in varying light conditions and in moderately saline, alkaline water low in oxygen. Bat guano was the primary source of organic material (Conde-Costas and González de Segal 1996).

Historical Range/Distribution

The distribution of the genus *Typhlatya* is disjoint and includes Mexico, the Antilles, Bermuda, Ascension Island, and the Galápagos Islands (Hobbs 1994). *Typhlatya monae* was discovered in 1954 from Mona Island, an island located off the southwest of Puerto Rico. The specimens were collected from water located in a concrete basin at the Mona Island airstrip. The basin contained groundwater that had been pumped into it from an adjacent well. *Typhlatya monae* was later (1974) found in two caves in the Guánica Commonwealth Forest, located in the southwestern part of Puerto Rico (Peck 1981). *Typhlatya monae* has also been found in Barbuda (Chace and Hobbs 1969) and in the Dominican Republic (Hobbs *et al.* 1977). Little is known concerning this species' status in either Barbuda or the Dominican Republic.

Current Range/Distribution

Surveys conducted in 1974 (Peck and Kukalova 1974) and in 1995 (Conde-Costas and González de Segal 1996) on Mona Island did not locate any specimens of *Typhlatya monae* at the historical locality or at other areas surveyed on the island. Currently, in Puerto Rico, the species is known only from three caves in the Guánica Commonwealth Forest: 1) El Refugio, 2) Carmen, and 3) Los Murciélagos. The largest population of *Typhlatya monae* was found in the lagoon located in the El Refugio cave. Individuals were distributed in a clumped or patchy pattern, caused perhaps by a patchy distribution of food.

Population Estimates/Status

Estimates of 1,970 individuals in the El Refugio cave, 40 in the Carmen cave, and 2 in the Los Murciélagos cave were made in 1995. No additional surveys of caves and aquifers in both Guánica and Mona Island have been conducted since then to determine the status and population number of *Typhlatya monae.*

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. The largest population in Guánica is found in the El Refugio cave. This is also the most accessible of the caves and is, therefore, the most vulnerable to human impact. Human impact may result from contamination of the lagoon, as well as from vandalism, including fires, and collection. These caves are visited frequently, and a large amount of garbage accumulates in them. Some types of garbage may degrade the quality and composition of groundwater that could be lethal to *Typhlatya monae* (e.g., resulting in anoxic conditions). An additional threat to the species may be from the development of the groundwater resources, resulting in a change in groundwater quality, as well as pumping, and the resultant removal of individuals. Contamination of recharge areas from landfills or spills from storage tanks may result in the contamination of groundwater in the Guánica caves. Groundwater in the Guánica cave system is connected; therefore, even if landfills or fuel /industrial residue storage tanks are not located close to the caves inhabited by *Typhlatya monae*, their contents may infiltrate into the web of underground water. While the species was not found in Mona Island in 1995, Conde-Costas and González de Segal (1996) indicated that the species might still be found in the reef deposit aquifers on the island's southwest coastal plain. Development of this groundwater resource may result in water quality changes or actual removal of the individuals. Although the island is designated as a Natural Reserve, managed by the Puerto Rico Department of Natural and Environmental Resources, numerous developments, including a super port, a prison, and most recently, a hotel, has been proposed. Such facilities would require a source of freshwater.

B. Overutilization for commercial, recreational, scientific, or educational purposes. While collection has not been documented to be a threat, it may become a threat in the future because the Guánica caves are open to the public and receive frequent visitation. The rarity of this species may make it a valuable item for animal collectors.

C. Disease or predation. Neither disease nor predation has been documented as a threat to the species. Nevertheless, predation by species such as the introduced toad *Bufo marinus*, which is common in the Guánica Forest, may become a threat in the future.

D. The inadequacy of existing regulatory mechanisms. The Commonwealth of Puerto Rico does not currently protect this species. Federal listing would result in its inclusion as a threatened or endangered species, under the Commonwealth's Regulation for the Management of Vulnerable and Endangered Species. Although the Commonwealth manages Mona Island and the Guánica Forest, development projects continue to be proposed in both areas. Management plans for Commonwealth forests include the protection and conservation of species classified under Puerto Rico Department of Natural and Environmental Resources' regulations as critical, threatened, or endangered. Actions that may impact such species are generally scrutinized, and measures to

minimize or avoid impacts to these species are recommended and implemented, if deemed appropriate.

E. Other natural or manmade factors affecting its continued existence. *Typhlatya monae* is currently known only from one large population and two additional localities where very few individuals have been found. Little is known concerning its status in either Barbuda or the Dominican Republic; nevertheless, Caribbean islands are under intense development pressure. One of the most important factors affecting the continued survival of this species is its limited distribution. Any catastrophic event (such as hurricanes) or impact from humans (e.g., contamination) that affects the major population may result in the extinction of the species.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

The Puerto Rico Department of Natural and Environmental Resources are aware of the presence of *Typhlatya monae* within caves in Commonwealth forests and natural reserves under their jurisdiction. Surveys of the *Typhlatya monae* have been conducted on both Mona Island and in the Guánica Commonwealth Forest between 1994 and 1995.

SUMMARY OF THREATS:

Little is known concerning the status of *Typhlatya monae* in either Barbuda or Dominican Republic; therefore, potential stocks for reintroduction purposes may not be available. Changes in groundwater quality, collection of rare animals, predation, limited distribution of the species, limited availability of appropriate habitat (i.e., underground aquifers within cave formations), potential reduction of food sources (e.g., mortality or reduction in bat populations), and low population numbers threaten populations of *Typhlatya monae*. These threats are not imminent, because the known populations are found within Commonwealth forests and natural reserves that afford some level of protection, but they provide sufficient information on biological vulnerability of the species to maintain *Typhlatya monae* as a candidate species, albeit issuance of the proposed rule on this species is precluded by higher-priority listing actions.

LISTING PRIORITY

| THREAT | | | |
|---|---|---|---|
| Magnitude | Immediacy | Taxonomy | Priority |
| **High** | Imminent | Monotypic genus | 1 |
| | | Species | 2 |
| | | Subspecies/population | 3 |
| | **Non-imminent** | Monotypic genus | 4 |
| | | **Species** | **5*** |
| | | Subspecies/population | 6 |

| | | | |
|---|---|---|---|
| Moderate to Low | Imminent | Monotypic genus<br>Species<br>Subspecies/population | 7<br>8<br>9 |
| | Non-imminent | Monotypic genus<br>Species<br>Subspecies/population | 10<br>11<br>12 |

**Rationale for listing priority number**
*Magnitude:*

The historical range of *Typhlatya monae* has been reduced to include only three caves within the Guánica Commonwealth Forest (the species was not found again in Mona Island) that appear to be interconnected through underground water flow. Therefore, changes in water quality to any of these underground water systems, resulting from pollution or other sources, may affect the entire population of *Typhlatya monae*.

*Imminence:*

The immediacy of threats to *Typhlatya monae* is medium to low because the range of this species is within forests administered and managed by the Puerto Rico Department of Natural and Environmental Resources. Management plans for Commonwealth forests include the protection and conservation of species classified under Puerto Rico Department of Natural and Environmental Resources' regulations as critical, threatened, or endangered. Actions that may impact such species are generally scrutinized, and measures to minimize or avoid impacts to these species are recommended and implemented, if deemed appropriate. No imminent threats have been identified for the species or its habitat.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing warranted? No. At the time of this review, there was no indication that threats to *Typhlatya monae* have increased, or that population numbers have been reduced from previous numbers.

DESCRIPTION OF MONITORING:
*Typhlatya monae* has not been monitored since 1995. In June 2004, the Service contacted Mr. Miguel Canals, Puerto Rico Department of Natural and Environmental Resources manager for the Guánica Forest, who indicated that they did not know the current status of *Typhlatya monae* in Guánica.

COORDINATION WITH STATES (indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment):

The Puerto Rico Department of Natural and Environmental Resources regularly invites the Service to participate in forums and symposia related to the management of the Guánica Commonwealth Forest, where threats to habitat of *Typhlatya monae* in Guánica and need for species monitoring are considered.

Indicate which State(s) did not provide any information or comments: N/A

LITERATURE CITED

Alvarez, F., T.M. Iliffe, and J.L. Villalobos. 2005. New species of the genus *Typhlatya* (Decapoda: Atyidae) from anchialine caves in Mexico, the Bahamas, and Honduras. Journal of Crustacean Biology, 25: 81-94.

Bouchard, R.W. 1995. Taxonomic validation for crustacean species on the U.S. Fish and Wildlife Service category 2 species list, brdsar0004. U.S. Geological Survey, Washington, DC.

Chace, F.A. and H. H. Hobbs. 1969. The freshwater and terrestrial decapod crustaceans of the West Indies. U.S. National Museum Bulletin 292. 258 pp.

Chace, F.A. and R.B. Manning. 1972. Two new caridean shrimps, one representing a new family, from marine pools on Ascension Island (Crustacea: Decapoda: Natantia). Smithsonian Contributions to Zoology, 131: 1-17.

Conde-Costas, C. and C. González de Segal. 1996. Distribution, abundance and habitat characterization of the troglobitic groundwater shrimp - Typhlatya monae in Puerto Rico. Tierra Linda Consultants. 69 pp.

Hobbs, H. H., H. H. Hobbs III, and M.A. Daniel. 1977. A review of the troglobitic decapod crustaceans of the Americas. Smithsonian Contributions to Zoology 244: 39-43.

Hobbs III, H. H. 1994. Biogeography of subterranean decapods in North and Central American and the Caribbean region. Hydrobiologea 287: 95-104.

Peck, S.B. 1981. Zoogeography of invertebrate cave faunas in southwestern Puerto Rico. National Speleological Society Bulletin 43: 70-79.

Peck, S.B. and J. Kukalova-Peck. 1974. The subterranean fauna and conservation of Mona Island: A Caribbean karst environment. National Speleological Society Bulletin 43: 59-68.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Jeffrey M. Fleming 11/16/2005
Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005

Conducted by: Boqueron, Puerto Rico Field Office